Title of the Invention

A machine for piercing sheets of material in a variety of patterns using an adjustable apparatus

Cross Reference to Related Applications

This application is based on provisional application serial number 60/426,141, filed on November 13, 2002.

Statement Regarding Federally Sponsored Research or Development

Not Applicable

Description of Attached Appendix

Not Applicable

Background of the Invention

This invention relates generally to the field of punching and more specifically to a machine for piercing sheets of material in a variety of patterns using an adjustable apparatus.

The use of hand actuated paper punches has a long history of use both for business and for various types of arts and crafts. Paper punches are used to form shapes in paper by cutting away a section of the paper using a cutting die designed to make a smooth cut and further designed with a specific geometry for that cut. Along with the cutting die, paper punches use a matching hole on the other side of the paper being

punched to allow the cutting die to pass completely through the paper while the hole and base of the frame with the hole hold and support that paper. The hole must be closely matched to the size and geometry of the cutting die to provide for a smooth cut. In addition, the cutting die must be manufactured with a set of edges that form the cutting surface and are located at an angle to the paper being punched to also insure a smooth cut.

The initial use for paper punching was to punch circular holes in paper that was then mounted in binders with a corresponding rings to hold that paper. Such binders usually with three rings to hold the paper are in wide use throughout the world in business. Similar punches are used in schools to compile the work pages of students.

Soon various artists realized that the cutting die or paper punches could be designed in various geometries and shapes to form special cutouts such as stars, circles and a myriad of other shapes and items. Currently there are a large variety of decorative paper punches used in a number of arts and crafts.

The configuration of the punch itself changed. Initially, paper punches looked much like a pair of pliers where the mechanism was held in the hand and paper placed between the cutting die and the base and then the handles squeezed to punch the paper. A spring was placed between the handles to return the punch to the open position when the punching operation was completed. Three hole punches often used a lever to allow the user to push down on that lever and move the three cutting dies down and punch

through the paper with a spring again returning the punch to the open position after the paper was punched.

Then the punch configuration changed to a button attached to the cutting die and held along with the return spring in a frame. A slot was provided in the frame to insert the paper to be punched and the button was pushed down to punch the designed pattern into that paper.

The next configuration for the paper punches uses a thumb-actuated lever to push down on the cutting die and punch out the pattern. This configuration is contained in United States Patent 5,749,278.

Both the push button punch and the thumb-activated lever punch are produced in a large variety of patterns by a number of suppliers. They are used in the arts and crafts industry in a number of applications. The punches vary in size as well as the pattern be be punched. ~~as punches grew in size, it became more difficult to push on the push button to punch through the paper. Helper were developed to assist in the use of the larger punches and to make it easier to punch a large number of patterns. These helpers are hinged arms that hold the punch and provide more leverage to the user of avoid fatigue and to punch larger patterns.~~

Although the punches were originally designed and are still labeled as paper punches, various users found that these punches could be used to punch patterns in a variety of materials in sheet form. These include: coated papers, plastic sheets, metallic foil sheets, special clays, leathers and others. As long as the material was in a sheet form

thin enough to fit into the punch, it could be punched into the pattern designed into that punch.

All of the new styles of paper punches are hand-held and hand operated. This is a particular advantage of the lever-actuated punch, which is specifically designed to be held and operated in one hand while the sheet of material is held and aligned with the punch in the other hand. All of these hand-held punches incorporate a housing that covers the frame and the cutting die while leaving the slot for the sheet of material. This is done to both protect the operator and to improve the appearance of the punch since that hand-held punch is clearly a consumer item. The housing often has the vendors name attached or incorporated into that housing along with a representation of the pattern of that particular hand-held punch.

~~It is important to note that the pattern of the hand-held punch is a closed geometry. It may be a simple geometry such as a circle or square or it may be a complex pattern such as a butterfly. The closed geometry means that the punch, in ordinary use without the invention, punches out a completed pattern in the sheet of material leaving a single hole in that sheet of material in the shape of the pattern of that hand-held punch and a piece of the material also in the shape of the punch pattern. This closed geometry also means that the punch is used away from the edge of the sheet of material so that the whole pattern of that punch can be cut into that sheet of material.~~

The major problem with all existing punches is the lack of flexibility. The punch can only punch out the designed pattern. The resulting piece can then be used as a decorative element in some type of craft and/or the resulting hole in the sheet of material could be

the decorative element. There was no way, for example, that a flower pattern could be partially punched out of a sheet of material with the pedals cut out, but the center left in the sheet of material.

Brief Summary of the Invention

The primary object of the invention is to provide an adjustable decorative punch that partially punches out a pattern in a sheet of material when properly adjusted. This punch can also be adjusted to fully punch out the pattern as with existing punches. With this punch, it would be possible to partially punch out a flower pattern leaving the center attached to the sheet of material and the pedal cut free. This would then provide a new and large variety of possible arts and crafts projects using this invention.

Another object of the invention is to make the adjustable apparatus easy to use,precise and easily manufactured using the same materials as used to make existing punches.

Another object of the invention is to allow the adjustable punch to be used with a variety of material types, thickness and qualities.

A further object of the invention is to provide an adjustable apparatus that will work with all of the currently available punch configurations and could be provided as a retrofit kit to existing punches.

Still yet another object of the invention is to provide a reliable and cost effective adjustable apparatus.

Other objects and advantages of the present invention will become apparent from the following descriptions, taken in connection with the accompanying drawings, wherein, by way of illustration and example, an embodiment of the present invention is disclosed.

There is disclosed a machine for piercing sheets of material with an adjustable apparatus that can be moved by hand where the adjustable apparatus acts as a stop to the moveable cutting die containing the punch pattern thereby varying the amount of the punch pattern cut into a sheet of material being punched. The moveable cutting die is designed with a cutting surface so that the adjustable apparatus can limit the amount of the sheet of said material cut by the cutting surface adjustable apparatus can be moved to a position so that the designed pattern of said punch is cut fully out of a sheet of material by the movement of the moveable cutting die. There is a frame which holds the adjustable apparatus and the moveable punch cutting die with the moveable cutting die held in the top of the frame and a hole aligned to the moveable cutting die in the base of the frame.

In accordance with a preferred embodiment of the invention, there is disclosed an adjustable apparatus that can be added to existing decorative sheet punches where the adjustable apparatus acts as a stop to the moveable cutting die containing the punch pattern.

Brief Description of the Drawings

FIG 1 is a side view of the invention where the punch action is actuated by a lever.

FIG 2 is a perspective view of the invention as shown in FIG 1

FIG 3 shows details of another variation of the invention.

~~Figure 4 shows the internal details common to all hand-held punches during a punching operation.~~

Detailed Description of the Preferred Embodiments

Detailed descriptions of the preferred embodiment are provided herein. It is to be understood, however, that the present invention may be embodied in various forms. Therefore, specific details disclosed herein are not to be interpreted as limiting, but rather as a basis for the claims and as a representative basis for teaching one skilled in the art to employ the present invention in virtually any appropriately detailed system, structure or manner.

As the field of hand operated and hand-held paper punches has evolved, a new style of punch has been developed. This style of punch is shown in United States Patent 5,749,278. The hand-held punch uses a thumb-actuated lever to create the action of the punch. The adjustable apparatus of the preferred embodiment of the invention can be seen in FIG 1 where an externally threaded element 530 has been incorporated into the thumb-actuated punch thereby forming the machine 500. A matching threaded portion 535 is incorporated into the housing 550 where the threads of that portion 535 match to those of threaded element 530 and thereby form the adjustable apparatus of the invention. In use a sheet of material is placed in the fixed size slot 581 and the lever 520 pushed down to actuate the machine 500. The threaded element 530 is then rotated to either raise or lower that element 530 to form a stop to the vertical travel of the action of the machine 500 and to cut some or all of the designed punch pattern into the sheet of material.

As further shown in FIG 1, the hand-held punch has a bottom portion 580. This bottom portion 580 contains the hole that closely matches the pattern of the cutting die. ~~595 of~~

~~FIG 4~~. As is well known in the industry, the actual spacing between the side of the cutting die 595 and the matching hole ~~590 of FIG 4~~ must be less than the thickness of the thinnest sheet of material being punched to achieve a sharp and repeatable cut. A problem occurs after a partial punch is achieved using the invention as described above to make a partial cut. The cut portion of the sheet of material ~~585 of FIG 4~~ will be pushed down into the hole ~~590 of FIG 4~~ making it difficult to remove that sheet of material ~~585. One option as shown by element 570 of FIG 1 would be a locking hinge that would maintain the slot 581 in a fixed size during the punching operation and then could be released following that punching operation to allow removal of the sheet of material 585. As another option the element 570 could represent a snap apart section of the punch 500 where the bottom portion 580 of the punch is removed after the punching operation to allow easy removal of the sheet of material 585. The preferred embodiment would be no hinge or snap apart mechanism since that is the most economical approach~~. In the preferred ~~this~~ embodiment, the operator uses a suitable tool to carefully push back any cut material away from the hole ~~590~~ so that the sheet of material ~~585~~ can be removed.

FIG 2 shows another view of the invention where a threaded subassembly consisting of parts 530 and 560 is added as a retrofit to a previously manufactured thumb actuated punch. The operation of the machine 500 is otherwise identical to that described above.

FIG 3 shows a separate adapter for the lever-actuated style of punch where a suitably designed threaded assembly 900 is attached to the lever actuated punch below the lever 521 of that prior art punch. A threaded bolt 910 is threaded into the matching threaded hole 920 of the threaded assembly 900 where it provides the same type of adjustment as described above in the description associated with FIG 1 where the

threaded bolt 910 replaces the threaded part 530 and the threaded assembly 900 replaces part 535.

~~FIG 4 shows the details of a punching operation where a sheet of material 585 has been inserted into the slot 581 of a punch and the cutting die 595 pushed down. The curved edge 598 of the cutting die 595 is piercing the sheet of material 585 and will continue downward through the matching hole 590 in the lower portion 580 of the punch. A portion of the housing 550, which covers the cutting die 595 and most of the rest of the punch, is also shown in this figure.~~

While the invention has been described in connection with a preferred embodiment, it is not intended to limit the scope of the invention to the particular form set forth, but on the contrary, it is intended to cover such alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.